



# Safety Data Sheet

## Micro - Professional 3-Part Nutrient Series

### SECTION 1. IDENTIFICATION

|                               |                                                                                                                              |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| Product Identifier            | Micro                                                                                                                        |
| Other Means of Identification | Nitrates and inorganic minerals in aqueous solution.                                                                         |
| Recommended Use               | Hydroponic plant nutrients.                                                                                                  |
| Restrictions on Use           | <i>Not Applicable</i>                                                                                                        |
| Initial Supplier Identifier   | <b>Emerald Harvest</b><br>1399 Corporate Center Parkway<br>Santa Rosa, California<br>95407 USA<br>Telephone: +1 866-325-8235 |
| Emergency Telephone Number    | <b>Tel: 1-707-799-7336</b><br><b>Hours: Monday to Friday, 9:00 am to 5:00 pm.</b>                                            |

### SECTION 2. HAZARD IDENTIFICATION

|                              |                                                                                                                                                                                                                                                                                                                                                                                        |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| GHS Classification           | <b>SERIOUS EYE DAMAGE/IRRITATION - CATEGORY 2A</b><br><b>SPECIFIC TARGET ORGAN TOXICITY - SINGLE EXPOSURE - CATEGORY 3</b>                                                                                                                                                                                                                                                             |
| Label Elements<br>Pictograms |                                                                                                                                                                                                                                                                                                     |
| Signal Word                  | <b>WARNING</b>                                                                                                                                                                                                                                                                                                                                                                         |
| Hazard Statements            | H319 – Causes serious eye irritation.<br>H335 – May cause respiratory irritation.                                                                                                                                                                                                                                                                                                      |
| Precautionary Statements     |                                                                                                                                                                                                                                                                                                                                                                                        |
| Prevention:                  | P261 – Avoid breathing fume/gas/mist/vapours/spray.<br>P264 – Wash hands thoroughly after handling.<br>P271 – Use only outdoors or in a well-ventilated area.<br>P280 – Wear protective gloves/eye protection/face protection.                                                                                                                                                         |
| Response:                    | P304 + P340 – IF INHALED: Remove person to fresh air and keep comfortable for breathing.<br>P312 – Call a POISON CENTER/Doctor if you feel unwell.<br>P305 + P351 + P338 – IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.<br>P337 + P313 – If eye irritation persists: Get medical advice/attention. |
| Storage:                     | P403 + P233 – Store in a well-ventilated place. Keep container tightly closed.<br>P405 – Store locked up.                                                                                                                                                                                                                                                                              |
| Disposal:                    | P501 – Dispose of contents/container to an approved waste disposal plant.                                                                                                                                                                                                                                                                                                              |
| Other Hazards                | Product contains less than 0.1% of a chemical known to cause cancer.                                                                                                                                                                                                                                                                                                                   |

**NOTES**

SDS is to be retained and available for use by employees and other users of the product.

**SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS**

| Chemical Name                                                    | CAS No.               | Concentration | Common name / Synonyms |
|------------------------------------------------------------------|-----------------------|---------------|------------------------|
| Calcium Nitrate                                                  | 13477-34-4            | 0.5 - 5%      | <i>Not Available</i>   |
| Ammonium Nitrate                                                 | 6484-52-2             | 0.5 - 5%      | <i>Not Available</i>   |
| Potassium Nitrate                                                | 7757-79-1             | 0.5 - 5%      | <i>Not Available</i>   |
| Urea                                                             | 57-13-6               | 0.5 - 1%      | <i>Not Available</i>   |
| Cobalt Nitrate                                                   | 10026-22-9            | <1%           | <i>Not Available</i>   |
| Iron EDTA                                                        | 15708-41-5            | <1%           | <i>Not Available</i>   |
| Sodium Borate                                                    | 1303-96-4             | <1%           | <i>Not Available</i>   |
| Sodium Molybdate                                                 | 10102-40-6            | <1%           | <i>Not Available</i>   |
| Copper EDTA                                                      | 39208-15-6            | <1%           | <i>Not Available</i>   |
| Manganese EDTA                                                   | 15375-84-5            | <1%           | <i>Not Available</i>   |
| Zinc EDTA                                                        | 14025-21-9            | <1%           | <i>Not Available</i>   |
| Non-hazardous ingredients or those below disclosure requirements | <i>Not applicable</i> | To Balance    | <i>Not Available</i>   |

**Notes****SECTION 4. FIRST-AID MEASURES**

|                                                               |                                                                                                                                                                                 |
|---------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Inhalation</b>                                             | If breathed in, move person into fresh air. If concerned or symptoms persist, seek medical attention.                                                                           |
| <b>Skin Contact</b>                                           | Rinse with plenty of water for at least 20 minutes. If concerned, seek medical attention.                                                                                       |
| <b>Eye Contact</b>                                            | Rinse with plenty of water for at least 20 minutes. Remove contact lenses if easily possible. If irritation persists, get medical attention.                                    |
| <b>Ingestion</b>                                              | Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. If large amounts are ingested, get medical attention immediately.        |
| <b>Most Important Symptoms and Effects, Acute and Delayed</b> | Acute:<br>EYE CONTACT: May cause irritation, itching, pain, redness, watering.<br>Chronic:<br><i>Not Applicable</i>                                                             |
| <b>Immediate Medical Attention and Special Treatment</b>      | Treat symptomatically. In case of inhalation of decomposition products in a fire involving this product, symptoms may be delayed. Keep under medical surveillance for 48 hours. |

**SECTION 5. FIRE-FIGHTING MEASURES**

|                                                           |                                                                                                                                   |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| <b>Extinguishing Media</b>                                |                                                                                                                                   |
| <b>Suitable Extinguishing Media</b>                       | Use extinguishing agent suitable for surrounding fire.                                                                            |
| <b>Unsuitable Extinguishing Media</b>                     | <i>None known.</i>                                                                                                                |
| <b>Flammability classification (OSHA 29 CFR 1910.106)</b> | Not Flammable.                                                                                                                    |
| <b>Hazardous Combustion Products</b>                      | Oxides of nitrogen, sodium, molybdenum and other unidentified toxic fumes.                                                        |
| <b>Specific Hazards Arising from the Product</b>          | If in a fire or containers are heated, pressure increases will occur and containers may rupture. Product may release toxic fumes. |

**Special Protective Equipment and Precautions for Fire-Fighters**

Isolate scene of the fire. Firefighters should wear proper protective equipment and self-contained breathing apparatus with full face piece. Move fire exposed containers from fire area if safe to do so. Use water spray to cool fire-exposed containers to prevent rupture.

## SECTION 6. ACCIDENTAL RELEASE MEASURES

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Personal Precautions, Protective Equipment, and Emergency Procedures</b> | Implement spill control plan. All persons dealing with the clean-up should be trained and wear the appropriate personal protective equipment. Do not touch spilled product. Ensure adequate ventilation. Remove all sources of ignition. Avoid breathing vapours or mists. Keep all other personnel upwind and away from the spill/release. Restrict access to area until completion of clean-up. Refer to Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION, for additional information on acceptable personal protective equipment.                                                                                                                                                                                                                          |
| <b>Methods for Containment and Cleaning Up</b>                              | Ensure spilled product does not enter drains, sewers, waterways, or confined spaces. If necessary, dike well ahead of the spill to prevent runoff into drains, sewers, or any natural waterway or drinking supply. Ventilate area of release. Contain and absorb spilled liquid with non-combustible, inert absorbent material (e.g. sand), then place absorbent material into an appropriate container for later disposal (see Section 13). Contaminated absorbent material may pose the same hazards as the spilled product. Do not use any combustible materials for clean-up (including cloth, etc.) as it presents a fire hazard upon drying out. Only use non-sparking tools and explosion proof equipment. Notify the appropriate authorities as required. |

## SECTION 7. HANDLING AND STORAGE

|                                      |                                                                                                                                                                                                                                                                                                                                      |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Precautions for Safe Handling</b> | Use with adequate ventilation. Wear suitable protective equipment during handling. Avoid breathing mist or vapours. Avoid contact with skin, eyes and clothing. Wash thoroughly after handling. Keep containers closed when not in use. Any combustible materials which contact the product should well-rinsed and laid flat to dry. |
| <b>Conditions for Safe Storage</b>   | Store in a cool, dry, well ventilated area, away from incompatibles. Inspect periodically for damage or leaks. Storage area should be clearly identified, clear of obstruction and accessible only to trained and authorized personnel. Keep in original container.                                                                  |

## SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### Control Parameters

| Chemical Name    | ACGIH® TLV®                     |                 | NIOSH OEL                  |                              |
|------------------|---------------------------------|-----------------|----------------------------|------------------------------|
| Urea             | 10 mg/m <sup>3</sup> , 8h (TWA) | Not Established | Not Established            | Not Established              |
| Cobalt Nitrate   | Not Established                 | Not Established | Not Established            | 0.02 mg/m <sup>3</sup> (TWA) |
| Sodium Borate    | Not Established                 | Not Established | 6 mg/m <sup>3</sup> (STEL) | 2 mg/m <sup>3</sup> (TWA)    |
| Sodium Molybdate | Not Established                 | Not Established | Not Established            | 0.5 mg/m <sup>3</sup> (TWA)  |

|                                         |                                                                                                                                                                   |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Notes</b>                            | <b>*Exposure limits may vary from time to time and from one jurisdiction to another. Check with local regulatory agency for the exposure limits in your area.</b> |
| <b>Appropriate Engineering Controls</b> | Use general or local exhaust ventilation to maintain air concentrations below recommended exposure limits.                                                        |
| <b>Individual Protection Measures</b>   |                                                                                                                                                                   |
| <b>Eye/Face Protection</b>              | Wear splash goggles or other appropriate eye protection. Avoid wearing contact lenses.                                                                            |
| <b>Skin Protection</b>                  | Wear impervious gloves. Avoid leather/cloth gloves.                                                                                                               |
| <b>Respiratory Protection</b>           | Not required under normal conditions of use. Do not breathe concentrated product. Wear respiratory protection if use will produce mists or splashing.             |
| <b>Other</b>                            | An eyewash station and safety shower should be made available in the immediate working area.                                                                      |

## SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

|                                            |                         |                                                       |                                            |
|--------------------------------------------|-------------------------|-------------------------------------------------------|--------------------------------------------|
| Appearance                                 | Liquid                  | Relative Density (water = 1)                          | 9.65 lb/gal at 68°F<br>(1.16 kg/L at 20°C) |
| Odour                                      | Not Available           | Solubility in Water                                   | Soluble                                    |
| Odour Threshold                            | Not Available           | Solubility in Other Liquids                           | Not Available                              |
| pH                                         | 4.5 - 6.5               | Partition Coefficient,<br>n-Octanol / Water (Log Kow) | Not Available                              |
| Melting Point and<br>Freezing Point        | Not Available           | Auto-ignition Temperature                             | Not Available                              |
| Initial Boiling Point and<br>Boiling Range | Not Available           | Decomposition<br>Temperature                          | Not Available                              |
| Flash Point                                | None up to 100°C (PMCC) | Viscosity                                             | Not Available                              |
| Evaporation Rate                           | Not Available           | Flammability (solid, gas)                             | Not Applicable (Liquid)                    |
| Vapour Density<br>(air = 1)                | Not Available           | Upper and Lower<br>Flammability or Explosive<br>Limit | Not Applicable                             |
| Vapour Pressure                            | Not Available           | Sensitivity to Static/Impact                          | Not Sensitive                              |

## SECTION 10. STABILITY AND REACTIVITY

|                                       |                                                                                                                                                                                                                                                                     |
|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reactivity                            | Not known or expected.                                                                                                                                                                                                                                              |
| Chemical Stability                    | Stable under normal conditions.                                                                                                                                                                                                                                     |
| Possibility of Hazardous<br>Reactions | Will not occur.                                                                                                                                                                                                                                                     |
| Conditions to Avoid                   | Avoid contact with incompatible materials.                                                                                                                                                                                                                          |
| Incompatible Materials                | Strong oxidizers, reducers.                                                                                                                                                                                                                                         |
| Hazardous<br>Decomposition Products   | On combustion, forms toxic fumes of phosphorus oxides. Decomposes on contact with alcohols, aldehydes, cyanides, ketones, phenols, esters, sulfides or halogenated organics. This produces toxic fumes. Attacks many metals. This produces flammable/explosive gas. |

## SECTION 11. TOXICOLOGICAL INFORMATION

### Likely Routes of Exposure

☒ Inhalation   ☒ Skin contact   ☒ Eye contact   ☒ Ingestion

\*Serious local effects by all routes of exposure.

| Acute Toxicity              |                                       |
|-----------------------------|---------------------------------------|
| LC50 (inhalation)           | Iron EDTA - 2.75 mg/L (Rat - 4h)      |
|                             | Sodium Borate - >2.04 mg/L (Rat - 4h) |
| LD50 (oral)                 | Calcium Nitrate - 302 mg/kg (Rat)     |
|                             | Potassium Nitrate - 3750 mg/kg (Rat)  |
|                             | Ammonium Nitrate - 2217 mg/kg (Rat)   |
| LD50 (dermal)               | Not Reported                          |
| Notes                       |                                       |
| Skin Corrosion / Irritation | May cause irritation and redness.     |

|                                                                  |                                                                                                                                                  |
|------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Serious Eye Damage / Irritation</b>                           | Redness. Pain. Tearing. Will be transient.                                                                                                       |
| <b>Inhalation</b>                                                | Causes coughing, shortness of breath, and irritation.                                                                                            |
| <b>Ingestion</b>                                                 | May cause irritation of the gastrointestinal tract including headache, nausea, vomiting, diarrhea.                                               |
| <b>STOT (Specific Target Organ Toxicity) - Single Exposure</b>   | Affects the respiratory tract and may cause damage to blood, mucous membranes.                                                                   |
| <b>Aspiration Hazard</b>                                         | Not reported.                                                                                                                                    |
| <b>STOT (Specific Target Organ Toxicity) - Repeated Exposure</b> | Not Expected.                                                                                                                                    |
| <b>Respiratory and/or Skin Sensitization</b>                     | Not known to be a sensitizer.                                                                                                                    |
| <b>Carcinogenicity</b>                                           | Cobalt Nitrate is classified by IARC as a Group 2B Carcinogen: Possibly carcinogenic to humans but is present at less than 0.1% in this mixture. |
| <b>Notes</b>                                                     | Target Organs: Eyes.                                                                                                                             |
| <b>Reproductive Toxicity</b>                                     |                                                                                                                                                  |
| <b>Development of Offspring</b>                                  | Sodium Borate is a suspected reproductive toxicant, fetotoxicity.                                                                                |
| <b>Sexual Function and Fertility</b>                             | Not reported.                                                                                                                                    |
| <b>Effects on or via Lactation</b>                               | Not reported.                                                                                                                                    |
| <b>Germ Cell Mutagenicity</b>                                    | Not expected to be a mutagen.                                                                                                                    |
| <b>Interactive Effects</b>                                       | Not reported.                                                                                                                                    |

## SECTION 12. ECOLOGICAL INFORMATION

|                                      |                                                                                           |                |                                  |
|--------------------------------------|-------------------------------------------------------------------------------------------|----------------|----------------------------------|
| <b>Ecotoxicity</b>                   | Contains ingredient which are toxic to the aquatic environment with long lasting effects. |                |                                  |
|                                      | <b>Ingredient</b>                                                                         | <b>Species</b> | <b>LC/EC<sub>50</sub></b>        |
|                                      | Calcium Nitrate                                                                           | Rainbow Trout  | LC <sub>50</sub> 98.9 mg/L (96h) |
|                                      | Ammonium Nitrate                                                                          | Carp           | LC <sub>50</sub> 447 mg/L (96h)  |
|                                      | Sodium Borate                                                                             | Goldfish       | LC <sub>50</sub> 178 mg/L (72h)  |
|                                      |                                                                                           | Water Flea     | EC <sub>50</sub> 1085 mg/L (48h) |
|                                      |                                                                                           | Green Algae    | LC <sub>50</sub> 158 mg/L (96h)  |
| <b>Persistence and Degradability</b> | <i>Not Available</i>                                                                      |                |                                  |
| <b>Bioaccumulative Potential</b>     | <i>Not Available</i>                                                                      |                |                                  |
| <b>Mobility in Soil</b>              | <i>Not Available</i>                                                                      |                |                                  |
| <b>Other Adverse Effects</b>         | <i>Not Available</i>                                                                      |                |                                  |

## SECTION 13. DISPOSAL CONSIDERATIONS

|                         |                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Disposal Methods</b> | Canadian Environmental Protection Act: All ingredients are listed in the DSL.<br>Dispose of in accordance with all federal, provincial/state, and local regulations.<br>Consult with your local supplier for additional information.                                                                                                                                               |
| <b>RCRA</b>             | If this product, as supplied, becomes a waste in the United States, it may meet the criteria of a hazardous waste as defined under RCRA, Title 40 CFR 261. It is the responsibility of the waste generator to determine the proper waste identification and disposal method. For disposal of unused or waste material, check with local, state and federal environmental agencies. |

## SECTION 14. TRANSPORT INFORMATION

| Regulation                                 | UN No. | Proper Shipping Name | Technical Name (for N.O.S. entry) | Transport Hazard Class(es) | Packing Group |
|--------------------------------------------|--------|----------------------|-----------------------------------|----------------------------|---------------|
| <b>Canadian TDG Regulations*</b>           |        |                      |                                   |                            |               |
| <b>49 CFR/DOT*</b>                         |        |                      |                                   |                            |               |
| <b>IATA Regulations*</b>                   |        |                      |                                   |                            |               |
| <b>IMDG Code*</b>                          |        |                      |                                   |                            |               |
| Note:                                      |        |                      |                                   |                            |               |
| <b>Notes: *NOT REGULATED FOR TRANSPORT</b> |        |                      |                                   |                            |               |

## SECTION 15. REGULATORY INFORMATION

| US Federal Information                                                            |                                                                                                  |                |                                                  |                                                                      |                                 |                       |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|----------------|--------------------------------------------------|----------------------------------------------------------------------|---------------------------------|-----------------------|
| Components listed below are present on the following U.S. Federal chemical lists: |                                                                                                  |                |                                                  |                                                                      |                                 |                       |
| Ingredients                                                                       | CAS Number                                                                                       | TSCA Inventory | CERCLA Reportable Quantity(RQ) (40 CFR 117.302): | SARA TITLE III: Sec. 302, Extremely Hazardous Substance, 40 CFR 355: | SARA TITLE III: Sec. 313        |                       |
|                                                                                   |                                                                                                  |                |                                                  |                                                                      | Form R - Reporting Requirements | Supplier Notification |
| Calcium Nitrate                                                                   | 13477-34-4                                                                                       | Yes            | No                                               | No                                                                   | No                              | No                    |
| Ammonium Nitrate                                                                  | 6484-52-2                                                                                        | Yes            | No                                               | No                                                                   | Yes                             | Yes                   |
| Potassium Nitrate                                                                 | 7757-79-1                                                                                        | Yes            | No                                               | No                                                                   | No                              | No                    |
| Urea                                                                              | 57-13-6                                                                                          | Yes            | No                                               | No                                                                   | No                              | No                    |
| Cobalt Nitrate                                                                    | 10026-22-9                                                                                       | Yes            | No                                               | No                                                                   | No                              | No                    |
| Iron EDTA                                                                         | 15708-41-5                                                                                       | Yes            | No                                               | No                                                                   | No                              | No                    |
| Sodium Borate                                                                     | 1303-96-4                                                                                        | Yes            | No                                               | No                                                                   | No                              | No                    |
| Sodium Molybdate                                                                  | 10102-40-6                                                                                       | Yes            | No                                               | No                                                                   | No                              | No                    |
| Copper EDTA                                                                       | 39208-15-6                                                                                       | Yes            | No                                               | No                                                                   | No                              | No                    |
| Manganese EDTA                                                                    | 15375-84-5                                                                                       | Yes            | No                                               | No                                                                   | No                              | No                    |
| Zinc EDTA                                                                         | 14025-21-9                                                                                       | Yes            | No                                               | No                                                                   | No                              | No                    |
| <b>Other</b>                                                                      | California Prop 65 - Cobalt Nitrate is expected to cause cancer and is present at less than 0.1% |                |                                                  |                                                                      |                                 |                       |

|                                                     |                                                                                                          |
|-----------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| <b>Safety, Health and Environmental Regulations</b> | Canadian Environmental Protection Act (CEPA):<br>All components of this product are on the Canadian DSL. |
|-----------------------------------------------------|----------------------------------------------------------------------------------------------------------|

| <b>NFPA Ratings</b>    | <b>Hazard or Risk Scale<br/>(0 = minimal, 4 = Significant)</b> | <b>HMIS Ratings</b>        | <b>Hazard or Risk Scale<br/>(0 = minimal, 4 = Significant)</b> |
|------------------------|----------------------------------------------------------------|----------------------------|----------------------------------------------------------------|
| <b>Health</b>          | 2                                                              | <b>Health</b>              | 2                                                              |
| <b>Flammability</b>    | 0                                                              | <b>Flammability</b>        | 0                                                              |
| <b>Reactivity</b>      | 0                                                              | <b>Physical Hazards</b>    | 0                                                              |
| <b>Specific Hazard</b> | X                                                              | <b>Personal Protection</b> | X                                                              |

## SECTION 16. OTHER INFORMATION

|                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Date of Creation</b>        | May 18, 2018                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Date of Latest Revision</b> | December 13, 2018                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Disclaimer</b>              | This Safety Data Sheet (SDS) was prepared by iHazmat Regulatory Ltd., using information provided by the above supplier. To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist. |

**\*SDS compliant with WHMIS 2015 and OSHA HAZCOM 2012**